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UNITED STATES OF AMERICA

HONOLULU
LA JOLLA
MONTEREY
TIBURON

SWFC

SOUTHWEST FISHERIES CENTER

MONTHLY REPORT - MARCH 1981

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SOUTHWEST FISHERIES CENTER

LA JOLLA, CALIFORNIA

HONOLULU LABORATORY
LA JOLLA LABORATORY
TIBURON LABORATORY
PACIFIC ENVIRONMENTAL GROUP

MONTHLY REPORT - MARCH 1981

STATUS OF PUBLICATIONS

Published

DeMaster, D. P. 1981. Estimating the average age of first birth in marine mammals. Can. J. Fish. Aquat. Sci. 38: 237-239.

The average age of sexual maturity and the average age of first birth should not be estimated with identical models. The two parameters often differ by at least 1 y because, among marine mammals, ovulation and parturition take place in different years because of the relatively long gestation period. Furthermore, the assumptions necessary to estimate the average age of sexual maturity cannot be made to fit the data used to estimate the age of first birth. Equating the two models is essentially equivalent to assuming that each ovulation will result in a birth. The described procedure lends itself well to age-specific data. Comparisons between populations should be with a Chi-square goodness-of-fit test.

Eldridge, M. B., J. A. Whipple, E. Eng, M. J. Bowers, and B. M. Jarvis. 1981. Effects of food and feeding factors on laboratory-reared striped bass larvae. Trans. Amer. Fish. Soc. 110(1): 111-119.

Fluctuations in year-class size of striped bass (Morone saxatilis) are believed related to early life-stage mortality. Factors associated with food and feeding of larvae were studied in the laboratory as they relate to mortality, point of no return, development, and energetics. Mortality of feeding larvae was directly related to density of Artemia salina nauplii. Highest mortality coincided with total oil globule absorption. Starved larvae lived an average 31 days after fertilization and did not display a well-defined point of no return. Growth and

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differentiation directly correlated with food density. Starvation affected the rate of ossification and altered cells and tissues as early as 7 days after hatching. Most of the endogenous energy of newly fertilized eggs is in oil. The rate of oil utilization was inversely related to food density. Daily food rations were estimated after ingestion and digestion rates were determined, and increased with larva size, age, and prey density.

Theilacker, Gail, and Kathleen Dorsey. 1980. Larval fish diversity: A summary of laboratory and field research. Intergovernmental Oceanographic Commission Workshop Report 28: 105-142.

Thomas, J., D. DeMaster, S. Stone, and D. Andriashek. 1980. Observations of a newborn Ross seal pup (Ommatophoca rossi) near the Antarctic Peninsula. Can. J. Zool. 58: 2156-2158.

A Ross seal mother and male pup (Ommatophoca rossi) were sighted on 14 November 1978 in Dallmann Bay near the Antarctic Peninsula. This is believed to be the first documented observation of a newborn Ross seal. Behavioral observations and standard measurements taken from this pup enhance the small amount of information known about the early life of the species.

Vrooman, Andrew M., Pedro A. Paloma, and James R. Zweifel. 1981. Electrophoretic, morphometric, and meristic studies of subpopulations of northern anchovy, Engraulis mordax. Calif. Fish Game 67 (1): 39-51.

We investigated the population structure of northern anchovy found between southern Baja California and Newport, Oregon. We used electrophoretic, morphometric, and meristic methods in our studies, and the results indicate the presence of three distinct anchovy subpopulations.

Approved by Center Director

Alvariño, Angeles. The depth distribution, relative abundance and structure of the population of the Chaetognatha, Sagitta scrippsae Alvariño 1962, in the California Current off California and Baja California. For consideration for publication in CalCOFI Reports.

Eldridge, M. B., J. A. Whipple, and M. J. Bowers. Bioenergetics and growth of striped bass (Morone saxatilis) embryos and larvae. For consideration for publication in the Fishery Bulletin, U.S.

Moser, H. Geoffrey, and John L. Butler. Description of reared larvae and early juveniles of the calico rockfish, Sebastes dallii. For consideration for publication in CalCOFI Reports.

Smith, Paul E. Field survey methods text. For consideration for publication as a Book Review in Ecology.

Technical Memorandum

Laurs, R. Michael, Ronald J. Lynn, Robert Nishimoto, and Ronald Dotson. 1981. Albacore trolling and longline exploration in eastern North Pacific waters during mid-winter 1981. NOAA-TM-NMFS-SWFC-10, 40 p.

Administrative Reports

La Jolla Laboratory

Kume, S., and N. Bartoo. 1981. Report of the fifth North Pacific albacore workshop. SWFC Admin. Rep. LJ-81-05.

Bada, J. L., and S. E. Brown. 1981. The amino acid ageing method: Dolphin studies 1979-80 report. SWFC Admin. Rep. LJ-81-06C.

HONOLULU LABORATORY

INSULAR RESOURCES INVESTIGATION

Ciguatera Workshop Held at the Honolulu Laboratory

Richard S. Shomura, Director of the Honolulu Laboratory, reports that the Laboratory and the University of Hawaii (UH) Sea Grant Program jointly sponsored a ciguatera workshop at the Laboratory, from March 18 to 20. The objectives of the workshop were to 1) bring together many of the principal ciguatera researchers to review the present status of ciguatera research in the Pacific, including the many anomalous results in ciguatera research to date, and 2) determine priorities for future research on this toxic condition in fish.

Honolulu Laboratory researchers prepared two working papers for presentation at the workshop: "Status of the Honolulu Laboratory ciguatera research on fishes of the Northwestern Hawaiian Islands, American Samoa, Western Samoa, Guam, and the Northern Mariana Islands," by Richard N. Uchida, Leader of the Insular Ecosystem Study Task, and Research Assistants Bernard M. Ito, Paul M. Shiota, Darryl T. Tagami, Karen P. Wendel, Victor A. Honda, and Michael P. Seki; and "An analysis of data from the kahala ciguatera sampling program, April 1979 to December 1980," by Dr. Jeffrey J. Polovina, Statistician, and B. Ito. In addition, seven background papers and nine other working papers were assembled for the workshop.

Honolulu Laboratory personnel involved in the workshop included R. Shomura, R. Uchida, J. Polovina, B. Ito, and Howard O. Yoshida. Southwest Fisheries Center Planning Officer David J. Mackett led the discussion during the final 2 days of the workshop to elicit ideas from the participants on research priorities and needs for the development of a research network. A report on the workshop, including the status of present ciguatera research and the direction of future research, will be prepared.

Latest Northwestern Hawaiian Islands Cruise to Collect Fishery Samples and Census Monk Seals

Richard Uchida reports that the NOAA research vessel, Townsend Cromwell, departed Snug Harbor, Honolulu, on March 18 to begin cruise TC-81-02 around the Northwestern Hawaiian Islands (NWHI). The objectives of the cruise are to conduct exploratory and experimental fishing and trapping for a wide variety of fish and shellfish, including penaeid and caridean shrimps, armorhead, alfonsins, bigeye scad, mackerel scad, kona crab, snappers, groupers, and tunas. The field work will also include censuses of the monk seal populations at selected islands and the collection of monk seal scat (stool) samples for diet studies. Honolulu Laboratory personnel taking part in the cruise include Heeny S. H. Huen, Chief Scientist, Wildlife Biologist Eric P. Knutson, and

Research Assistants William B. Barnett, Victor Honda, Paul Shiota, and Darryl Tagami.

Spiny Lobsters Sampled for Biological Studies

Research Assistants Alan R. Everson, Steven H. Kramer, James L. Prescott, and Gordon W. Tribble made nearshore scuba dives along the western shores of Oahu to locate aggregations of spiny lobsters, Panulirus marginatus, for sampling. These samples will be used in a study to estimate the size at first maturity of P. marginatus. Other material collected included gonads, stomachs, and muscle tissues for ongoing studies on spiny lobster fecundity, diet, and population genetics.

Growth Studies Based on Otoliths Continue

In a continuing effort to determine the periodicity of growth increments on fish otoliths, James H. Uchiyama, Fishery Biologist, examined otoliths from two kawakawa, Euthynnus affinis, and one opakapaka, Pristipomoides filamentosus, which were injected with tetracycline. Under an ultraviolet microscope, only one sagitta from one of the kawakawa showed any tetracycline marking.

Documentary Film on Resource Survey of Northwestern Hawaiian Islands Planned

Fishery Biologist Reginald M. Gooding and Dr. Jeffrey Polovina, Statistician, met with Dr. Robert Shallenberger of the U.S. Fish and Wildlife Service, and Dr. Richard W. Grigg, Hawaii Institute of Marine Biology (HIMB), University of Hawaii, for preliminary discussions on the production of a 16-mm documentary movie on the resource survey of the Northwestern Hawaiian Islands (NWHI) presently being conducted by the Honolulu Laboratory and other agencies under the Tripartite Agreement. It was agreed that all the available film footage in the possession of the various agencies should be assessed for possible inclusion in the film. Gooding completed a sequence inventory of the approximately 7,700 ft of film he has taken on cruises to the NWHI.

New CTD Data Recorder Installed on R/V TOWNSEND CROMWELL

Research Assistant Bernard M. Ito worked this month with Lt. Dean Smehil of the R/V Townsend Cromwell, and Robert Ferguson of the Hawaiian Institute of Marine Biology, University of Hawaii, to prepare new instructions for making CTD (chlorinity-temperature-depth) casts, which was necessitated by the installation of a new CTD data recorder system on the Cromwell. The data log form was also modified so that the serial number of the CTD could be included in the magnetic tape heading. A test indicated that the system was performing properly.

* * * * * * * * * *

Bernard Ito reports that 11% (52 out of 461) of the kahala sampled in March at the United Fishing Agency were rejected for borderline to positive levels of ciguatoxin. In comparison, 9% of the 482 fish sampled in March 1980 were rejected. Through the end of March 1981, 5,232 kahala have been tested for ciguatoxin and 762 (15%) have been rejected.

Length-Weight Relationship Determined for Oceanic Squid

Research Assistant Bert S. Kikkawa determined a preliminary length-weight relationship for the oceanic squid, Symplectoteuthis oualaniensis, based on 355 specimens caught during the recent Honolulu Laboratory-University of Hokkaido cooperative squid research cruise on the University of Hokkaido's Hokusei Maru. The length-weight relationship is described by the equation $\log_{10} Y = 0.309 \log_{10} X + 0.509$.

* * * * * * * * * *

Dr. Jeffrey Polovina collaborated with Dr. Gerald Marten of the East-West Center in revising their manuscript, "Comparative study of fish yields from various tropical ecosystems," which will appear in the Proceedings of the ICLARM/CSIRO Workshop on the Theory and Management of Tropical Multispecies Stocks.

FISHERY MANAGEMENT PROGRAM

Demand Analysis for Wholesale Bottomfish Market Completed

Dr. Michael F. Adams, Industry Economist, assisted by Research Assistant James C. Cooper, has completed a demand analysis of the wholesale bottom fish market for Oahu Island The objectives of the analysis are to determine how bottomfish prices are determined and how price is affected by 1) 12 species of fresh bottomfish supplied to the Oahu Island market from the Hawaiian Islands, 2) other fresh fish species which serve as substitutes, 3) imported frozen fish substitutes, 4) household income, and 5) seasonal changes in consumers' tastes. The analysis is part of a market study which will also make use of just-completed questionnaires by the Survey and Marketing Services, Inc., of wholesalers' acquisition and distribution of fresh and frozen fish in Hawaii.

Design of Sampling Procedure for Deep-Sea Handline Fleet Completed

Gary L. Kamer, Statistician, has developed a stratified random sample procedure to be used in obtaining Office of Management and Budget clearance for a cost-earnings survey of the deep-sea handline fleet. The survey design employs both optimal stratification techniques and optimum allocation within the strata.

Tuna Data Management Procedures Upgraded

Fletcher Riggs, Fishery Biologist, reports that progress has continued on tuna data management as information from additional sources are adapted to new, recently-implemented data management and documentation standards. Some additional effort has been directed toward information obtained from American Samoa, which comprises three major sets of data - logbook catch and effort data, cannery landings data, and albacore size-frequency data. A report is being prepared by Mark A. Scheele, Computer Technician, documenting the rather complex inter-relationships of the data sets, and providing several alternative means of streamlining current coding and capture procedures. Research Assistant Nathaniel T. Shippen has been assisting in the preparation and conversion of several other tuna data sets to conform to the new standards.

Efforts are also underway to improve current data handling and management procedures for the Insular Resources Task. A preliminary review of current procedures has been completed and the general objectives and course to be followed have been defined.

While primary data files will be maintained and documented in a manner similar to that recently adopted for the tuna data files, a secondary Data Base Management System for currently or frequently-used data will also be maintained. The system used will be a Statistical Analysis System (SAS), which provides both data management and data analysis capabilities.

The reasons for choosing an on-line data management/analysis package rather than a tape-oriented secondary file management (as adopted for tuna data) are: 1) the total volume of data is acceptable for on-line storage, 2) records needed for any given analysis are usually scattered throughout a large number of primary files, and 3) frequent use is made by the Insular Resources Task of existing software packages as opposed to writing custom programs.

Hawaii Skipjack Tuna Landings Continue Below Long-Term Average

The March 1981 Hawaii landings of skipjack tuna were estimated at 71.3 metric tons (MT), which is 58.9 MT above the March 1980 landings but 28.6 MT below the 1964-80 long-term average for March. The cumulative landings from January through March were estimated at 128.7 MT, which is 36.5 MT above the 1980 landings for the same period and 175.6 MT below the 1964-80 long-term average for the same period.

PELAGIC RESOURCES INVESTIGATION

A Sense of Magnetism Found in Tunas

Michael Walker, University of Hawaii graduate student, Dr. Andrew E. Dizon, Leader of the Pelagic Ecosystem Study Task, and Dr. J. L. Kirschvink of Princeton University suggest that an ability to respond to the compass and map cues provided by the Earth's magnetic field should be foremost in any migrating animal's arsenal of sensory abilities. Indeed, investigators have shown that the geomagnetic field or artificially-induced fields influence the orienting behaviors of many unrelated animals, although attempts to condition animals to magnetic fields have met with limited success. However, Walker, Dizon, and Kirschvink have successfully conditioned juvenile yellowfin tuna, Thunnus albacares, to respond to magnetic fields. In addition, they have located concentrations of magnetite within a highly-enervated pocket within the ethmoid bones. This presumably biogenic, magnetic material could serve as the sensory mechanism since sufficient amounts are present for both a compass and a map sense.

Five yellowfin tuna have now been successfully conditioned to discriminate between altered and normal magnetic fields. Each fish is initially trained to swim through a hoop presented for 30 seconds simultaneously with the positive or conditioning stimulus (S+). It is then rewarded for the first hoop pass after 30 seconds. After its behavior is stable, discrimination testing begins and both S+ trials and S- trials are presented. During the latter, a pass at the end of the 30-second test period earns nothing and the hoop is left in for an additional 10-second penalty period (maximum three penalties). Four of the five fish were tested with an altered field (comparable to the Earth's field at about 80° N latitude) as S+; the remaining fish were tested with the normal Hawaiian field as S+.

All five fish demonstrated discrimination. Learning curves were generated by treating the successive randomized S+ and S- trials as pairs and accumulating the differences between them (see accompanying figure). Lack of discrimination would keep the curve from increasing.

The strength of discrimination and rapidity of learning demonstrated by the yellowfin tuna, as compared to goldfish in a similar paradigm discriminating visual stimuli, attest to the importance of the magnetic stimuli to yellowfin tuna.

Although these behavioral experiments reveal the presence of a reliable response to some component of the magnetic field produced by the coil and direct current, the mechanism and stimulus parameters are as yet unknown. Two possibilities are conceivable: 1) detection of the electric fields induced by the animal as it swims through the two different magnetic fields (S-, S+), a form of electroreception, and 2) detection of the magnetic field directly by utilizing specialized sensory organelles containing magnetite.

Cumulative differences in pass rate during the positively reinforced trials and the negatively reinforced trials as a function of number of trial pairs. Accumulation of values above zero indicate learning is taking place.

Walker, Dizon, and Kirschvink favor the latter possibility. For the present, it is the simplest mechanism. Magnetite has been identified in honey bees, pigeons, bacteria, and dolphins. Walker, Dizon, and Kirschvink found inducible magnetic remanence in tuna using the superconducting (SQUID) magnetometer at the Institute of Geophysics, University of Hawaii. By process of elimination, they localized an area of high magnetic remanence in tissue embedded within the ethmoid bone complex. The active tissue nestles within convolutions below the smooth upper roof of the dermethmoid and appears to contain nervous, vascular, and connective tissues. The active tissues are characterized by the presence of dark pigmentation. Small area electron diffraction analysis conclusively demonstrated that the oxidation-resistant pigment contains magnetite.

Gross dissections of the ethmoids and the front of the skull revealed the active tissue area to be enervated by the large supraorbital trunk. In tuna, only a very few, small rami were observed to leave the trunk before the active region.

Although the investigators realize that their data infer rather than establish a geomagnetic response mechanism, it is difficult not to attribute a

geomagnetic sensory system to tunas when these data, the data of previous workers on other animals, and the compelling needs of a long-range migrator are considered.

Fish Ova From Seabird Spew Identified

At the request of Thomas S. Hida, Fishery Biologist, Dr. Geoffrey Moser, Fishery Biologist at the SWFC, La Jolla Laboratory, identified ova found in the spew of Laysan albatross, Diomedea immutabilis, and blackfooted albatross, D. nigripes, for a continuing study of the food habits of seabirds. Except for two samples, which turned out to be ova from the saury, Cololabis saira, all the ova were identified by Moser as those from flyingfish. This new information has been added to the data set on seabird spew. Hida also worked with Computer Programmer Sally H. Kuba, who is writing a program to extract various data summarizations on seabird spew.

Third and Final Leg of Cooperative Squid Research Cruise Completed

Walter M. Matsumoto, Chief Scientist on the final leg of the cooperative squid research cruise on the University of Hokkaido's Hokusei Maru, reported that the vessel completed its work in Hawaiian waters and departed for Japan on March 2. In addition to experimental squid fishing, the Hokusei Maru fished nine longline stations to fulfill the University of Hokkaido's course requirements for the students on board.

The catch for the nine longline stations included: 16 yellowfin tuna, 36 bigeye tuna, 78 albacore, 11 skipjack tuna, and 2 tuna jaws, for a total of 132 tunas; 20 striped marlin, 7 shortbill spearfish, and 4 swordfish, for a total of 31 billfishes; 3 wahoo, 5 bramid, 2 moonfish, and 4 Lepidocybium flavobrunneum (similar to walu). Twelve striped marlin and 1 swordfish were tagged and released, even though all except the swordfish were caught outside the 200-mile Fishery Conservation Zone. All other billfishes were either dead or shark-eaten when hauled up. The catch rate of tunas (1.78 fish per 100 hooks) was rather low, most likely due to the hooks fishing too deep in rather cool waters (surface water temperatures ranged from 25.5° to 19.7° C).

Squid jigging was attempted on February 22 and 23, and again on the 27th and 28th. On the first two attempts, jigging was stopped after 1 hour of fishing due to high winds and sea conditions. No squid were caught on either occasion although several were seen at the surface. Jigging was not done during the next 3 days due to rough seas. With improved weather on the 27th and 28th, squid fishing was done for 2 and 2.5 hours, respectively. The catch consisted of five squids on the 27th and six on the 28th. The total weight of the squids caught was 12.6 pounds.

Matsumoto was assisted on the cruise by Biological Technician Bert S. Kikkawa.

Preparations Continue for Summer Larval Rearing Program

Thomas K. Kazama, Fishery Biologist who heads the tuna culture program at the Kewalo facility, reports that Sharon D. Hendrix, University of Hawaii graduate student, has been successful in culturing the hapacticoid copepod, Tigriopus sp. Hendrix is also analyzing stomach contents of net-caught skipjack tuna larvae in an effort to relate types and sizes of prey to larval length and mouth gape. This analysis should provide information on a suitable diet for larval tunas and be useful to the summer laboratory rearing efforts.

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Research Assistant Martina K. K. Queenth reports that the skipjack tuna ova samples collected at the cannery during March show increased sizes which indicate that the spawning season may begin soon.

LA JOLLA LABORATORY

Coastal Fisheries Resources Division

Dr. Kurt Lillelund, Director of the Institute of Fishery Biology, University of Hamburg, Completes Sabbatical at Southwest Fisheries Center

Dr. Kurt Lillelund, visitor from the Institute of Hydrobiologie und Fischereiwissenschaft of the University of Hamburg, has completed a 6-month sabbatical with the Coastal Fisheries Resources Division. While at the La Jolla Laboratory, he studied the predatory effect of carnivorous planktonic copepods on the mortality of early stages of anchovy larvae, as a follow-up to former experiments by Dr. Reuben Lasker, CFRD Chief, and Lillelund in 1970.

An attempt was made to determine the number of predators and their prey at the surface of the sea off La Jolla and San Diego, California. Sixteen neuston samples were examined from stations in this area (a main spawning area of anchovies) from March and April 1978. No correlaton was found between the number of eggs or larvae in the samples and the number of carnivorous copepods. The maximum number of eggs in the 3-minute neuston tows was 42,825, while the maximum number of larvae was 287. In 6 samples the number of adult carnivorous copepods varied between 0 and 2247, but generally they numbered between 10 to 100 per tow.

Because handling of early larvae usually results in additional mortality, most experiments were started with late anchovy eggs. In some preliminary experiments, however, it was necessary to start with larvae and efforts were then made to reduce the handling mortality. Best results were achieved when the water temperature was elevated: i.e., handling mortality was reduced for 0-day old larvae in water temperatures of 16° to 24° C, and 2- to 4-day old larvae survived best in waters 16° to 22° C. For example: larva 35 hrs old: mortality due to transfer - 16° C, 31%; 22° C, 14%. Mortality due to aeration - 16° C, 47%; 22° C, 7%.

The carnivorous copepods which were studied were caught in coastal waters 2 to 4 miles SW of San Diego (Point Loma). There were great variations in the composition and the nutritional condition of the copepod community in autumn and winter 1980 in this area. Adults and copepodites in different stages were caught in large numbers, particularly near the offshore edge of the kelp. One species, Pontellopsis occidentalis, was generally dominant, especially during a short upwelling period at the end of February 1981.

Adults of the two carnivorous Labidocera species could be kept alive in large 100-liter containers with a surface of 0.4 m^2 for 1 to 2 weeks, and adult Pontellopsis remained alive more than 4 weeks when fed with Gymnodinium, Isochrysis, and early nauplii of Artemia; experiments were done with copepods 1 to 3 days after the catch. Most experiments were started with 25 Artemia nauplii/liter, 10,000 Gymnodinium/liter, and a small quantity of Isochrysis,

because early experiments had shown that anchovy larvae mortality decreases when additional prey is offered to carnivorous copepods.

Container volume and surface area were variables being considered in these predator-prey experiments. Most experiments were run in darkness over 36 hrs because newly hatched Artemia nauplii are phototactic. Even in darkness, anchovy larvae stay near the surface during the first 2 days of life, but the copepods and additional prey organisms were mostly distributed homogeneously in the total water volume of the container. The experiments were done in:

16 - 10 liter containers (with a surface area of 0.1 m^2) with 5-50 larvae and 1-10 copepods per container,

4 - 100 liter containers (surface area 0.2 m^2) with 30-50 larvae and 5-20 copepods per container, and

4 - 300 liter containers (surface area 1.1 m^2) with 100-150 larvae and 5-20 copepods per container.

A preliminary analysis of the results of these experiments has shown that under these experimental conditions, all three copepod species were able to kill 0- to 2-day old anchovy larvae, even in the largest containers with the smallest number of copepods and larvae. In the 300 liter containers, the number of larvae killed per copepod of the three specimens ranged from 0 to 4 larvae. There is some indication that copepods sometimes became selective and sought out larvae. In addition, those copepods which fed for several days on Artemia nauplii seemed to be less effective in catching and killing anchovy larvae than those which had no experience in catching and eating larvae over a longer period. In this case, larvae offered even in large numbers were obviously ignored. There was no clear indication of mortality from 4- to 13-day old larvae due to carnivorous copepods.

A preliminary conclusion of this investigation is that at least a part of the natural mortality rate of anchovy larvae during their first 2 days of life in the sea is due to carnivorous copepods. This will occur especially in patches, in those places where both carnivorous copepods and larvae gather in high numbers.

Staff Members Join USC Cruise to Study Effect of Upwelling on Survival of Anchovy Larvae

Dr. Reuben Lasker, OFRD Chief, Jack Brown, Electronics Engineer and Jack Metoyer, Biological Technician, joined the University of Southern California OPUS (Organization of Persistent Upwelling Structures) cruise on board the R/V Velero for two weeks in March to study the distribution and condition of anchovy larvae asssociated with an upwelling center. Adjacent to the coast between Pt. Conception and Pt. Arguello, California, is a dynamic upwelling region that appears to be mainly independent of wind but which is accentuated greatly when winds from the northwest begin in the spring. Lasker took samples of anchovy larvae from within and at the periphery of the upwelling

plume to test the hypothesis that upwelling dilutes and disrupts aggregated food layers which are needed by larval fish to satisfy their food requirements. A new in situ fluorometer was used, together with the Free Fall Particle Counter developed by Brown. Both instruments showed interesting patterns which seem to indicate that the particle maximum in this region coincides closely with the chlorophyll maximum. Samples of water taken at the same time and place will be examined to identify the particles involved.

The CalCOFI vertical egg tow net was used for rapid zooplankton collections in the area and some samples contained relatively large anchovy larvae. Anchovy larvae were preserved rapidly aboard the ship and will be examined histologically as time permits to see if the larvae were starving in the upwelling plume area.

A unique aspect of the cruise was the use of satellite remote-sensing images which were relayed to the vessel in order to allow the most efficient deployment of the vessel to study centers of upwelling.

Dr. Richard Dugdale of USC was the scientific leader of the cruise, part of the National Science Foundation-sponsored OPUS program.

ALBACORE FISHERIES PROGRAM

Satellite Remote Sensing Applications in Fisheries Research

Satellite Images Used to Locate Upwelling Centers

Remote Sensing Specialist Randee Recht captured and processed infrared surface temperature images from the day and night orbits of the NOAA-6 satellite for a period of 2 weeks, coincidental with Dr. Reuben Lasker's participation aboard the R/V Velero. During the same time period, Recht also captured images from the Nimbus-7 Coastal Zone Color Scanner satellite, which were processed by Jose Palaez, SIO graduate student working with Lasker and Dr. R. Michael Laurs.

In cooperation with the Scripps Remote Sensing Facility, 4 hrs of prime-time for computer processing were assigned to Recht each day. She reviewed each satellite pass and selected six processed NOAA-6 images that revealed surface temperature structure along a coastal region centered about Pt. Conception, California. Under the supervision of Oceanographer Ron Lynn, the salient features were outlined and transferred to a map for transmission over FAX by radio station WWD. These images provided Lasker with real-time information on the distribution of ocean surface temperatures and allowed the most efficient routing of the ship to study centers of upwelling.

Oceanographic Data Submitted to EDIS

This month Oceanographer Ken Bliss submitted data for five albacore/oceanography cruises to the Environmental Data and Information Service (EDIS) for archiving. Processed data from salinity/temperature/depth (STD) casts were translated from binary to alpha-numeric format and copied to tape. Each cruise was reviewed and a description written giving the processing techniques and estimates of data quality. The magnetic tapes and supporting documentation were given to local EDIS representative Nelson Ross.

* * * * * * * * * *

This month Dr. Michael Laurs, Oceanographer, made a poster presentation to the California Space Institute Conference held at the California Institute of Technology. His topic concerned fisheries satellite work as it relates to the anchovy and albacore research program at the Southwest Fisheries Center. Laurs also attended a meeting at the Jet Propulsion Laboratory where possible plans were discussed as to what direction ocean remote sensing may take in view of the cancellation of the National Oceanic Satellite System.

COMMERCIAL AND RECREATIONAL FISHERIES RESEARCH FOR MANAGEMENT

Minimum Size Limit Proposed for Commercially-Caught Bonito

The California State legislature has recently recognized the need for management of the bonito fishery. Two bills have been submitted, both of which establish a 5-pound minimum size for commercially-caught bonito.

The State-Federal team of Dr. Gary Stauffer of the Southwest Fisheries Center and Alec MacCall, California Department of Fish and Game (CF&G), first demonstrated a condition of bonito overfishing in 1974. A subsequent State-Federal study, produced in 1978, documented the collapse of the southern California segment of this stock, and presented management options for rehabilitation of the resource. One of these options was a 5-pound minimum size for commercially-caught bonito. This option allows at least one spawning to occur before fish become subject to the fishery.

Support of the size limit regulation from both the recreational and commercial fishing contingents has been obtained as a result of recent meetings of CF&G representatives with fishery representatives. There still remains, however, a disagreement on the extent to which the recreational fishery should comply with the size limit. Bonito larger than 5 pounds are seldom available to the recreational fisherman, but smaller bonito remain a favorite target species despite their present low abundance. The partyboat (i.e., commercial passenger-carrying recreational fishing vessel) industry claims that it would be severely impacted if less than five undersized fish (less than 5 pounds) are allowed to be retained by the angler. On the other

hand, the commercial fishing industry may experience a virtual cessation of bonito fishing for several years, due to lack of fish larger than 5 pounds. For this reason, commercial fishing representatives feel that no more than two undersized fish should be retained by the angler, so that the recreational fishermen share the burden of rehabilitating the resource. No agreement on this issue has been reached, but the outlook now appears good that the bonito fishery will soon be managed by the California Department of Fish and Game.

Half of 1981 CalCOFI Cruises to Study Anchovy Spawning Biomass Completed

Jim Thrailkill, Fishery Biologist, reports that the first half of the scheduled 1981 CalCOFI cruises for collecting data to estimate the 1981 anchovy spawning biomass were completed by March. These include the 8101 and 8102 Jordan cruises, the 8102 New Horizon cruise, the first Nelle Belle charter cruise, a California Department of Fish and Game sonar/midwater trawl survey. The surveys were generally completed as planned, although bad weather forced the dropping of some offshore CalCOFI stations on the New Horizon cruise. The direction of survey of three vessels was modified to run north to south because of the delay in Mexican research permits. There was insufficient time north of Pt. Conception, California, to collect midwater trawl samples.

According to Dr. Gary Stauffer, Fishery Biologist, 126 trawl hauls were made aboard the Nelle Belle and a total of 92 anchovy samples were preserved for estimating fraction of female spawning. Collections were made from Pt. Conception to Pt. Baja.

Preliminary analysis of the sex ratio of the trawl-caught anchovies shows an evening cycle of 50% females in early evening hours, dropping to a low of 10-30% during the spawning hours of 2000 to midnight, then returning to 50% after midnight. The Nelle Belle was also able to work alongside CF&G purse seine charter, Mary Louise. Eric Lynn, Biological Technician, was aboard the Mary Louise and collected 10 samples of adult anchovies between 1800 and 0200 hours over three nights. During these hours adult anchovies were scattered throughout the upper mixed layer and did not school. The Nelle Belle made comparative trawl hauls adjacent to the first six purse seine sets. The sex ratios from the six trawl samples were consistent with the general pattern found for the trawl samples described above, while the sex ratio for the purse seine samples were about 60% females throughout the evening. Based on these results, plus the finding by Dr. John Hunter in 1979 that the few females in male-dominated catches are usually spawning, Stauffer and Ken Mais of the California Department of Fish and Game hypothesized that anchovies segregated during the spawning hours, with non-spawning individuals (Day 1 and other females) scattered in the surface layer, and spawning females (Day 0) and males at the mid-depths of the upper mixed layer. Mais will attempt to sample nearer the surface at night on the second Nelle Belle cruise, in order to examine this hypothesis further.

Based on the sonar results of the first Nelle Belle cruise, Mais reported that anchovies were present throughout most of the region surveyed, from Pt.

Conception to Pt. Baja, except in the far north and in the more offshore areas of southern California and northern Baja California. Major concentrations were detected in Santa Cruz Basin south of Santa Cruz Island, off Santa Monica Bay, from Los Angeles to San Diego, and between Cape Colnett and San Quintin.

The next series of cruises, 8104 Jordan and the second Nelle Belle, departed San Diego on March 31 for Pt. Baja to begin the second egg/trawl survey. The New Horizon will depart April 7. Plankton sorting for the bongo samples has been completed for the January 8101 cruise and is in progress for the February-March 8102 cruises. Sorting of the CalVET samples for anchovy eggs for the egg production estimate is scheduled to begin about July 1.

US/Soviet Cooperative Ichthyoplakton Survey Underway

The 12th annual US/Soviet cooperative ichthyoplankton survey for spawning hake populations begun on March 23. This year the Soviet R/V Poseydon had permission to conduct research in the Mexican 200-mile economic zone. The vessel will occupy CalCOFI lines 103 to 60 over a 30-day period. Dimitry Abramenkoff, SWFC Biological Technician, and Antonio Diaz de Leon, INP Ensenada, are the participating U.S. and Mexican scientists. The Soviet Chief Scientist is Igor Zhuteev, a hydrologist who has participated in many of the earlier surveys. Results for hake from the 8102 Jordan and New Horizon cruises and Poseydon cruise will be summarized and given to the Northwest and Alaska Fisheries Center and the Northwest Region prior to the beginning of the 1981 whiting (as hake is now known commercially) season.

Sakagawa and MacCall to Co-Convene AFS-AIFRB Symposium

Dr. Gary Sakagawa, Leader of the Oceanic Fisheries Resources Division, and Alec MacCall, California Department of Fish and Game, will act as co-convenors of a joint American Fisheries Society-American Institute of Fishery Research Biologists symposium on marine fisheries. The symposium will be part of the program of the AFS meeting to be held in September 1981 in Albuquerque, New Mexico. The symposium has been entitled "Coping with Environmental Variables in Marine Fishery Models."

Statistical Design of Midwater Trawl Survey Developed

This month Susan PIcquelle, Statistician, studied strategies for sampling anchovies taken by midwater trawls. Data from these fish are used to estimate spawning fraction, sex ratio, and female body weight. These estimates are used to form the spawning biomass estimate for the central subpopulation of the northern anchovy.

The object of the study was to find the combinations of sample size (number of trawls, n) and subsampling fraction (number of fish per trawl, m) that minimizes the coefficient of variation (cv) of the estimate for a given level of cost of collecting and processing the sample. The trade-off between n and m is determined in part by the intratrawl correlation coefficient (ρ).

This statistic measures how similar fish are within trawl as compared to all fish lumped together into one sample. For high intratrawl correlation coefficients, it is more efficient to make more trawls and take fewer fish per trawl.

Picquelle used the data set from the 1980 midwater trawls to estimate for the parameters spawnning fraction, sex ratio, and female body weight. Then, based on the equation defining ρ, she expressed $\bar{m}$ as a function of n, given the estimate of ρ, for specified values of cv. Susan Iacometti, Computer Specialist, plotted this function for several values of cv, allowing a visual analysis of the trade-off between n and $\bar{m}$ (see Figures 1 and 2).

Picquelle also derived a cost function for collecting and processing the sample, and found expressions for the values of n and $\bar{m}$ that minimize the total cost.

Economic Study for Wetfish Fleet Planned

Dr. Daniel Huppert and Jane McMillan, Industry Economists, met with Larry Bozanich, Manager of the Fishermen's Cooperative Association of San Pedro, to discuss an economic study of the wetfish fleet. The study will document changes in the financial framework that have occurred in the past few years and will provide background information for future analyses of fishery regulations. The economic data will also support an appraisal of capital requirements for continued fleet operations and orderly vessel replacement.

* * * * * * * * * * *

Dr. Daniel Huppert, Task Leader, accompanied Ed Ueber, Industry Economist at the Tiburon Laboratory, to the University of California, Davis, to discuss Sea Grant research projects with Professors Garoyan, Howitt, and Johnston. The objective for the trip was to help the Sea Grant people formulate important issues for research and to learn the status of the projects.

LARVAL FISHES, COASTAL EAST PACIFIC

Study Complete on Effect of Food Rationing on Growth and Survival of Anchovy Larvae

This month Fishery Biologist Gail Theilacker and Biological Technician Patricia Hadley completed a series of larval fish feeding experiments that were conducted during the last 3 months using northern anchovy. The overall objective of the study was to determine how environmental factors affect growth and survival of fish larvae. The series of experiments concentrated on describing the relation between feeding and growth. Photoperiod and temperature were kept constant while prey type and prey density were varied. The data gathered will be analyzed to determine how variations in prey type and density affect larval fish feeding rates, daily ration, evacuation, growth

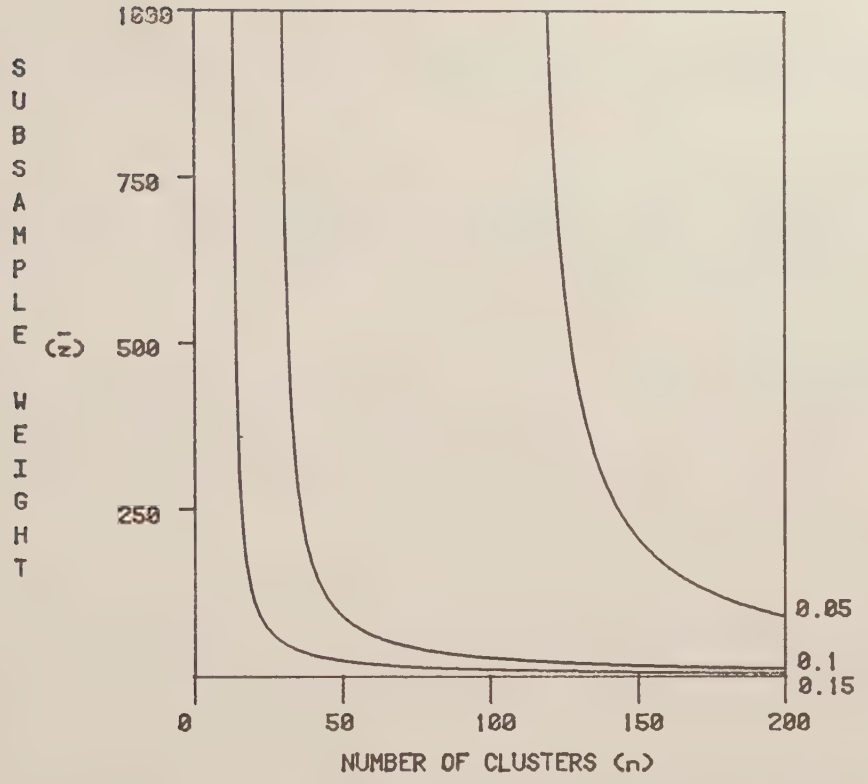

Figure 1. Combination of Subsample size and Number of clusters needed to achieve Coefficient of Variation equal to 0.025, 0.05, 0.1 and 0.15 for the estimated spawning fraction using "day-one" females.

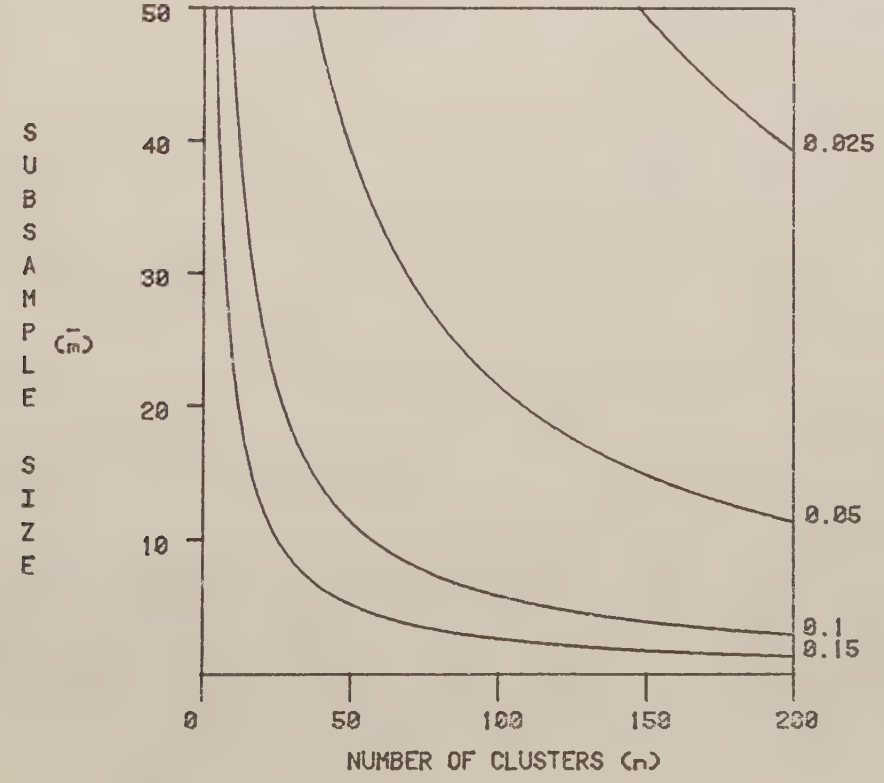

Figure 2. Combinations of Subsample size and number of Clusters needed to achieve Coefficient of Variation equal to 0.025, 0.05, 0.1 and 0.15 for the estimated sex ratio of anchovies.

(increase in size and dry weight), otolith increment number and otolith size, and gross growth efficiencies (ratio of change in fish weight to weight of food eaten).

Theilacker and Hadley reared anchovy larvae from eggs spawned by laboratory-maintained adult anchovy. Fishery Biologist Roger Leong administered hormone injections to the anchovy to induce spawning. For one experiment, wild larvae hatched from eggs collected by Kurt Lillilund were used.

The four completed experiments were conducted at 15.5° C (the average temperature at which anchovy spawn) with a 12-hour photoperiod and in 100 liter rearing tanks. Two types of prey were offered at each of two densities - rotifers, Brachionus plicatilis, at 2 and 25/ml, and copepods, Tigriopus californicus, nauplii and copepodites, at 0.08 and 2/ml. Biological Technician Eric Lynn provided the food cultures.

Larvae were sampled at 5 to 15 minute intervals throughout the 12-hour feeding day and subsequently grouped by 0.2 mm size classes onto a clean slide to dry and weigh. Two to three times a week, otoliths were dissected from 5 to 10 larvae that were reared on each of the four diets, in order to measure daily growth.

All the variables studied have been entered on computer cards by Computer Assistant Kathy Senini. In particular, each fish sampled is listed on a card by date, number, age, size, weight, diet, number and size (weight) of prey in gut, time of day sampled, otolith radius, and increment number. These variables will be used to relate maximum weight of food eaten and growth (fish size, weight, and otolith size) to prey type and density. Seventeen type and size categories were used for prey items, thus data are available on prey size selection by feeding anchovy larvae and change in prey size selected with age of larva.

Larval anchovy daily ration will be calculated from feeding data and the evacuation rate (i.e., dry weight of prey cleared through gut/hour). Gut clearance times were determined for fish of vaious ages on two test diets. Larvae first were fed prey which had been dyed. After the larvae had filled their guts, a known density of non-dyed prey were added to the containers. The larvae were sampled at 5 to 10 minute intervals and the time required for them to void their guts of the dyed prey was measured.

Gut clearance times of actively feeding larvae were found to be independent of age but were dependent on prey type and possibly dependent on prey density as well. The average time needed to clear the guts of anchovy larvae feeding on rotifers was 1.15 hours (range = 0.7-1.5 hrs) and for feeding on copepods, 2.73 hrs (range = 2.0-3.25 hrs). These were high prey density diets, i.e., 25 rotifers/ml and 2 copepod nauplii/ml. Theilacker and Hadley were not able to develop a technique to determine gut clearance rates at the low prey densities. Evacuation rates (mg prey cleared through gut/h) will be calculated for all size classes by dividing the weight of the maximum larval gut contents at age/size (for anchovy larvae reared on high density

rotifer or copepod diets) by the average gut clearance time for each prey type.

Review of the Biology of Clupeoid Fishes Completed

Dr. John R. Hunter, Leader of the MARMAP I, Larval Fishes, Coastal East Pacific Program, and Dr. John Blaxter, Dunstaffnage Marine Research Laboratory, Oban, Scotland, completed a first draft of a manuscript entitled, "The biology of clupeoid fishes," during their 30-day stay at the Rockefeller Center, Villa Servilloni, in Bellagio, Italy. The manuscript will be published by Academic Press in their series, "Recent Advances in Marine Biology" in 1980.

SURVEY SYSTEMS DEVELOPMENT AND EVALUATION

Lowered Primary Productivity Predicted for Southern California Bight Area

Higher-than-normal sea temperatures along the coast near La Jolla, California, could point to lowered primary productivity in this area. During February and March 1981, temperatures off the Scripps Institution of Oceanograpy Pier were about 1° C higher than the 1948-1967 average. According to a recent paper by Dr. Paul E. Smith, Leader of the Survey Systems Development and Evaluation Program, and Dr. Richard W. Eppley of the Food Chain Research Group, Scripps Institution of Oceanography, this positive temperature anomaly would indicate a lower-than-normal primary production into the Southern California Bight area. Normal temperature for this time of year is 14° C and normal production is 348 mg Carbon per square meter per day (mg $Cm^{-2}d^{-1}$). This anomalous high temperature is predicted to lower primary production to 240 mg $Cm^{-2}d^{-1}$ 108 mg Carbon less than normal or 70% of normal. Frequency of anchovy spawning will be monitored by Dr. John Hunter's group to ascertain if the interval is lengthened by low production.

Oceanic Fisheries Resources Division

TUNA/BILLFISH RESOURCES PROGRAM

Striped Marlin Top Species in 1980 Cooperative Marine Gamefish Tagging Program

The Cooperative Marine Game Fish Tagging Program, sponsored by the Southwest Fisheries Center, recorded the greatest number of striped marlin tagged in the history of the program, according to Fishery Biologist James

Squire. Of the 1,202 striped marlin tagged in 1980, 1,152 were tagged and released by U.S. anglers fishing about the tip of Baja California Sur, Mexico. Other species tagged included 228 billfish (blue and black marlin, sailfish, and shortbilled spearfish), 180 sharks and rays (mako, hammerhead, blue, leopard, bronze whaler shark, and bat ray), and 78 miscellaneous (yellowfin tuna, dolphin fish, bonito, roosterfish, jack cravalle, amberjack, and white seabass), for a year total of 1,688.

Tuna and Billfish Data Transferred from INFONET to Burroughs Computer System

Computer Programmer Bob Nydam has completed transferring all tuna and billfish data from an INFONET computer system to a Burroughs computer system. The transfer was necessitated by the termination of the INFONET system contract. Approximately 200,000 data records were transferred, including data on total catches of Atlantic tuna and tuna-like fishes, logbook catch and fishing effort for the Atlantic tuna fisheries, length-frequencies of Atlantic tunas, and tag release and recovery data for Pacific billfishes.

A standard format for all data has been assembled and documentation is almost completed. Nydam, Mathematician Al Coan, and Computer Technican Dennis Kremer are proceeding with the next step, which is the conversion of software and creation of data structures on the Burroughs system and on a VAX system.

Status of Atlantic Tuna Fishery Data Sampling

As of April 1, 1981, two U.S. tuna purse seiners fishing since the beginning of the year in the Atlantic Ocean had unloaded their catches in Puerto Rico. Seven size composition samples were collected for the SWFC by Inter-American Tropical Tuna Commission personnel. The sampled catch by species are as follows:

Species	Vessels sampled	# of samples	# of fish sampled
Yellowfin	2	3	150
Skipjack	2	3	151
Bigeye	1	1	8

Foreign-caught Atlantic tunas transshipped to Puerto Rico were also sampled during the month for size and species composition. Biological Technician Eugene Holzapfel collected the samples at landing ports of Mayaguez and Ponce. Due to the time lag involved with transshipments, the samples involved fish caught in 1980. A summary of all samples collected by Holzapfel through April 1, 1981, of fish caught in 1980, is as follows:

Species	Gear	No. of samples	No. of fish sampled	Tonnage sampled (MT)
Yellowfin	Baitboat	44	2813	318.69
	Purse seine	15	1077	2174.87
	Unknown			
Skipjack	Baitboat	27	1369	4350.00
	Purse seine	17	858	5511.82
	Unknown (LL)	2	100	3.26
Bigeye	Baitboat	21	1020	166.87
	Purse seine	7	199	236.04
	Unknown			
Albacore	Longline	11	459	2260.26

MARINE MAMMAL BIOLOGY AND TECHNOLOGY PROGRAM

Dolphin Simulation Test of the Satellite Marine Mammal Transmitter Performed

This month Jacqueline G. Jennings, Fishery Biologist, and Raymond K. Stives, Biological Technician, with Larry Stogner, Electrical Engineer, Fisheries Engineering Laboratory (FEL), Southeast Fisheries Center, conducted a test of the satellite marine mammal transmitters under conditions which simulate the surfacing behavior of a free-swimming dolphin in an ocean environment. The test was conducted in the 90-ft tow tank at the Scripps Hydraulics Laboratory, Scripps Institution of Oceanography, from March 19-25. A model fiberglass dolphin was rotated in a 4 ft arc around an axle mounted to the underside of the tow cart. The electrically-driven cart was moved down the length of the tow tank at a maximum velocity of approximately 2 knots, a realistic speed for a swimming dolphin. The model dolphin was automatically rotated beneath the moving cart to precisely simulate the surfacing time of a free-swimming dolphin. Waves were generated in the tank to further simulate actual field conditions.

Testing of the satellite marine mammal transmitters was conducted in three phases during predicted orbital passes of the Nimbus 6 satellite. One transmitter was mounted on the dorsal fin of the model and the other served as a control. Phase I consisted of rotating the model dolphin in a stationary position. Surfacing time, i.e., exposure of the transmitter's antenna, was set at 1200 to 1400 msec. The second transmitter was manually submerged and surfaced following each successful transmission from the rotating transmitter. Transmissions were monitored using a HANDAR 402B test set. Data from these experiments were encouraging, with multiple messages received and reasonable

position locations. During this phase, physical parameters interfering wtih reception of the satellite were defined.

Phase II consisted of moving the rotating dolphin at a forward velocity of 2 knots. The surfacing time of the model dolphin was again set at 1200 to 1400 msec. Unfortunately, a series of poor quality satllite orbits complicated interpretation of the results. Few messages were received and no position fixes were possible from the moving simulator.

The final phase involved dividing the orbit period in half, with the simulator moving down the tank during the initial 5 minutes and rotating in place during the second 5 minutes. Substantially fewer messages were received while the transmitter was subjected to a forward velocity. The test was terminated by the FEL. Several problems were identified with the electronics which the contractor must correct to meet the specifications. The transmitters will be tested further by the SWFC before any field trials.

Conference Held on the Use of Remote Sensing for Tracking Marine Mammals

Fishery Biologist Jacqueline Jennings participated in the Conference on the Use of Remote Sensing for Tracking Marine Mammals in Santa Barbara, California, on March 21-22. The conference, sponsored by NASA, the Marine Mammal Commission, and the Center for Environmental Education, was attended by people with diverse backgrounds, ranging from field biologists familiar with conventional tracking techniques to a physicist involved in an extensive remote sensing program to study polar ice movements. The main goals were (1) to evaluate and make recommendations on the use of remote sensing to study specific problems, such as minke whales in the southern oceans, and (2) to consider marine mammals from a global ecology perspective as possible indicators of ocean process, etc., through the use of satellite telemetry.

Jennings gave a presentation on her satellite tracking project and served on the Technology Working Group. The most important recommendations of the working group were that specifications be relaxed for animal tracking to make the receivers more sensitive and that NASA personnel be involved as technical advisors. A report is being prepared summarizing the conclusions of the meeting.

Working Paper Presented at Marine Mammal/Fishery Interaction Meeting

Dr. Douglas DeMaster, Wildlife Biologist, and John Henderson and James Coe, Fishery Biologists, completed a draft of a manuscript which was presented at the working group meeting on marine mammal/fishery interactions of the International Union for Conservation of Nature and Natural Resources (IUCN), held March 30-April 1, 1981, at the Southwest Fisheries Center. The paper summarizes the contract report dealing with fishery/marine mammal interactions that was prepared by the California Department of Fish and Game. In addition, information on the dollar value of fish lost to marine mammals was estimated

where possible, and inferences from the "Cooperative Marine Mammal Salvage Program" were made concerning mortality of marine mammals due to fishery interactions.

Polar Bear Seminar Given at Scripps Institution of Oceanography

Dr. Douglas DeMaster, Wildlife Biologist, gave a seminar entitled, "Use of litter size estimates in determining cub survival and reproductive interval," on March 18, 1981, at the Scripps Institution of Oceanography ecology seminar. DeMaster referred to research he directed while working for the U.S. Fish and Wildlife Service in Alaska and discussed the derivation of the equations he used to estimate the survival rate of cubs and the reproductive interval of adult female polar bears from information on litter size.

Manuscript on Blood Serum Drafted

Warren E. Stuntz, Fishery Biologist, and Thomas Shay, Biological Technician, have completed a first draft of a manuscript on the blood serum constituents of spotted and spinner dolphins. The manuscript presents data on about 20 blood serum constituents and describes investigations made on the effects of hemolysis and the effects of freezing blood for storage prior to analysis.

Sundown Sets Analysis

Fishery Biologist James Coe and Computer Specialist Charles Oliver report that the Inter-American Tropical Tuna Commission (IATTC) data, to be included in on-going analyses of differential porpoise mortality occurring in sets made after sundown, have been successfully extracted and moved to the University of California, San Diego's, VAX computer system. During February, the National Maine Fisheries Service data were moved to the VAX system and preliminary statistics were developed for the years from 1977 through most of 1980. With the remainder of the 1980 NMFS data now available, and the incorporation of the IATTC data for 1979-1980, the data base is complete. Summary statistics and a report will be written, with an anticipated completion date of June 1, 1981.

Format for Elephant Seal Data Base Completed

Dr. Douglas MeMaster, Wildlife Biologist, met with Harriet Huber, Point Reyes Bird Observatory (PRBO), to prepare a format for the elephant seal data base. PRBO has a contract with the Marine Mammal Commission to put on a computer all of the data they have collected since 1959, when the first elephant seal hauled out at the Farallon Islands near San Francisco, California, to 1972, when breeding began. Since 1972, studies on elephant seals at the Farallons have been sponsored by the Marine Mammal Commission and

the National Marine Fisheries Service. Currently, PRBO is under a 1-year contract with the SWFC to continue their research. Programs developed at the SWFC will be used to help analyze these data.

Documentation of Porpoise Observer Data

Computer Specialist Charles Oliver has compiled a number of documentation packages detailing the historical porpoise observer data. In the capacity of Data Manager for the project from 1976 through 1980, Oliver and his staff developed, implemented, and maintained a computerized and manual system for managing these data. A series of FORTRAN computer editing programs are currently executed on individual cruise files, and the output reviewed by the Data Editing Group. The process is repeated until all "errors" have been corrected. The data files are then archived to data bases using another series of computer programs. The documentation packages cover procedures, as well as the computer programs, and are organized as follows:

1. The Porpoise Observer Data Edit Programs 1978-1981 - contains specific edit checks performed by computer edit programs on Set Log, Fishing Mode, Marine Mammal Sight and Effort, Life History, and Cruise Specifications Records.

2. The Supplemental Marine Mammal Program Data Edit Programs 1975-1981 - contains specific edit checks performed by computer edit programs on Bridge Log, Aerial Survey Sighting and Transect, and Cross Data Base records.

3. The Marine Mammal Program Data Management Procedures.

4. The Marine Mammal Program Data Editing Procedures.

5. The Marine Mammal Program Computer Data Structure.

Generalized Computer Editing Programs

Computer Specialist Charles Oliver and Computer Programmer Robert Butler have developed and documented a "Data Verification System for Fixed Format Data." The series of FORTRAN subroutines can be used to quickly produce computerized edit programs for any fixed format data. The edit checks performed include variable specific range and missing data detection, as well as specifying logical relationships using multiple variables. The programs are developed using 20 "common subroutines" written in FORTRAN, and have been in use by the Porpoise Data Management Group since 1978.

MARINE MAMMAL MONITORING AND ASSESSMENT PROGRAM

Third EPOCS Cruise Completed by SWFC Observers

Biological Technicians Robert Pitman and James Cotton have completed their third trip studying cetacean populations across the breadth of the eastern tropical Pacific. Both observers left Seattle, Washington, on January 20, aboard the NOAA ship Oceanographer, which is participating in the Equatorial Pacific Ocean Climate Study (EPOCS). A stopover was made in San Diego on March 25 while enroute back to Seattle. The ship followed a track between Seattle and 7° S along 110° W longitude, providing a profile of populations across areas poorly studied so far. The observers searched for cetaceans, using 25X binoculars, whenever the ship was underway.

Pitman and Cotton recorded 234 sightings, about two-thirds of which were identifiable by species. Striped and spotted dolphins were the most commonly identified species. The two observers reported tuna-dolphin associations north of the equator, an equatorial belt with numerous sperm whales, and a southern hemisphere belt that was notable for its abundant fish-bird feeding associations. Spotted dolphins were seen in the latter areas, but were not associated with fish.

These areal differences of the cetacean populations and their feeding modes are no longer unexpected. Previous work, including that aboard previous EPOCS cruises, indicate that these patterns may be typical features. The Porpoise Assessment Group is planning to continue placing marine observers aboard the EPOCS ships. The next trip will be in May and will follow a similar track.

1980 Observer Data Editing Completed

The porpoise mortality and sightings data and tuna vessel activity log collected by NMFS observers aboard U.S. tuna vessels in the eastern tropical Pacific in 1980 have all been edited and added to computer data bases. Data editors Mike Gregory, Bob Franco and Tom Gronholt have been involved with preparing these data, which are from 50 vessel cruises and contain some 69,000 individual records.

Current activities in data editing include 1981 tuna vessel observer data check in, overseen by Bob Franco, with two cruises returned to date, and continuing transcription of 1971 to 1973 observer data to 1975 formats, with 37 of the 52 cruises coded to date.

Computer Conversion Underway

Computer Specialist Joe Caruso is supervising the work of Systems Programmer Analysts Susan Boyer, Celia Jacobs, Chuck Devlin, and Jay Walker, under a contract with Electronic Data Systems, Inc., in transferring data and

program files from the INFONET computer system to the University of California, San Diego's VAX system. File transfer procedures have been developed to insure that all files are properly transferred. Computer programs used on INFONET will also be converted by the analysts to run on the VAX, following a priority list which has been developed by the porpoise program staff.

Computer Specialist Ken Wallace has been exploring the problem of data access on the VAX. He has developed general requirements and possible methods using DATATRIEVE, a VAX system data management package, and is considering possible extensions to this package allowing automatic formating of data for FORTRAN programs.

TIBURON LABORATORY

FISH COMMUNITIES INVESTIGATION

Research Cruise to Study Shortbelly Rockfish Completed

Scientists aboard the R/V David Starr Jordan this month collected spring season samples of the shortbelly rockfish, Sebastes jordani; these samples are part of the quarterly samples which are jointly being taken by the Predator-Prey Task and Rockfish Analysis Task of the Tiburon Laboratory. During the 10-day cruise, 15 midwater and bottom trawl stations were completed in attempts to sample the rockfish, and 22 plankton samples were taken with a Tucker net in attempts to monitor its prey. Despite this effort, only 23 specimens of shortbelly rockfish were taken, an inadequate sample for analysis of food habits, size, or distribution. Hydroacoustic transects in the area produced targets thought to be shortbellies, but the fish proved elusive when the trawls were set. It was decided that the relative absence of shortbellies in the collections reflected certain limitations of both shipboard gear and personnel rather than actual numbers of shortbellies in the area. This was supported by the fact that the commercial trawler Colintino Rose II took at least 4 tons of shortbellies in every trawl set during several days fishing under charter to the Fisheries Resource Development Task of the Tiburon Laboratory.

Fishery Biologist Tony Chess was aboard the Colintino Rose II during this successful cruise, and served as Cruise Leader aboard the Jordan. Other participating scientists on the Jordan cruise included Fishery Biologists Susan Smith and Tina Echeverria of the Fish Communities Investigation, Biological Technician Mike Bowers of the Physiological Ecology Investigation, and Research Assistants Dana Tryde, John Berge, and Mark Kobe of San Francisco State University.

Cohort Analysis Program Revisions Completed

Dr. William H. Lenarz, Leader of the Rockfish Analysis Task, has completed revisions of the Computer Program GENCOH, originally written by Dr. William Fox of the Southeast Fisheries Center. This program uses the "Murphy Method" to perform cohort analyses of fisheries data. The analysis, an important tool in stock assessment, is used to estimate age, specific fishing mortality, and population size from age compositions of fish catches. GENCOH, in contrast to other available programs, allows the analyst to link cohorts by assuming that the ratio of fishing mortalities for two selected age groups is constant over time or that all fish beyond a selected age have the same mortality in a given year. These two assumptions are often made in stock assessments, but the lack of a program that incorporates the assumptions required considerable time-consuming work on the part of the analyst. In addition to the normal tables of output generated by cohort analysis programs, GENCOH also creates tables of estimated biomass by age and cohort. Lenarz and

Fox are writing a review paper on cohort analysis and description of the program.

FISHERIES DEVELOPMENT INVESTIGATION

Fishing Successful for Shortbelly Rockfish

Development of a domestic fishery for shortbelly rockfish (Sebastes jordani) made an important gain this month when the commercial trawler Colintino Rose II caught over 75 tons of fish. The vessel, skippered by Carl Burlesci, was chartered by the Tiburon Laboratory. Cruise Leader Patrick Rutten (NOAA Corps), Fishery Biologist Sus Kato, and Fishery Aid Susan Pollock participated in the cruise, which lasted several days. They report that the fish - about 9 to 10 inches long - were caught in 16 tows, in 6 days of fishing off Point Sur, California. The average duration of tow (i. e., time between deployment of the trawl at fishing depth and start of hauling of the tow cable) was 37 minutes, and the average successful catch was 9,500 pounds. Three tows were aborted.

Equally important as the high catch rate of shortbelly rockfish was the low incidental catch of bocacco and chilipepper rockfish. Total catch for these species in 16 tows was about 3,000 pounds, or 2% of the shortbelly catch. Local fishermen have voiced their concern about possible high incidental catch of these species, and catch rates from this cruise should help assuage their fears. By-catch was high in one tow, however, when two tons of large widow rockfish were caught with 6.8 tons of shortbellies. Later analysis of the fathometer paper showed that the school of widow rockfish were identifiable, and could possibly have been avoided, according to the captain.

Fishing gear consisted of a No. 8 Polish rope wing trawl and a pair of 5-m^2 "Suberkrub" doors. The cod-end was lined with 60 feet of 1-1/4-inch mesh liner. A sonar unit, a track plotter, two fathometers, an automatic Loran receiver, and a headrope transducer were used by the captain to locate fish and conduct aimed-trawling operations. Most of the shortbelly were caught near the bottom, in depths of 75 to 85 fathoms.

The catch was packed and frozen by two processors, in Monterey and Oakland, California. The fish will be shipped to Japan and Africa for trial sales. Some of the shortbelly may be further processed before sale. Several domestic wholesalers were provided with samples to learn if the fish could be sold locally.

Fishery Biologist William Leet is currently serving as Cruise Leader during the remainder of the charter period, which will be devoted to fishing for euphausiids; some trial fishing for shortbelly rockfish with a new "semi-pelagic" trawl may also be done, in order to test catch rates of incidental species. On this part of the cruise, Leet will be assisted by Fishery Biologist Sennen Salapare.

Figure 1. Fishery Biologists Sus Kato and William Leet aboard the 80-foot commercial trawler Colintino Rose II from Fort Bragg, California - one of the new breed of mid-water trawlers.

Figure 2. Carl Burlesci, Captain of the Colintino Rose II, looks on as 5 tons of shortbelly rockfish are packed in the fish-hold.

PHYSIOLOGICAL ECOLOGY INVESTIGATION

Overview of Status of Cooperative Striped Bass Study

The Cooperative Striped Bass Study Team is nearing completion of its sample and data analysis of striped bass from the San Francisco Bay-Delta and other areas, such as Oregon (1978 to 1980). During this month, further laboratory studies were designed to examine the cause-and-effect relationships between pollutants, parasite loads, and other parameters measuring condition and health of the bass, a fish popular with recreational fishermen.

Research outlines also were made and preparation for the experiments is nearing completion. Laboratory studies will begin in April.

The Cooperative Striped Bass Study (COSBS) was designed to determine potential long-term effects of pollutants on striped bass, which had been selected as a model species. As outlined in previous Center Monthy Reports, the striped bass population is in a serious decline in the San Francisco Bay area and the COSBS is exploring possible causal factors for the decline.

* * * * * * * * * * *

Members of the Physiological Ecology Investigation met with other investigators on the COSBS Team, including Dr. Donald Crosby, Dr. Gerald Bowes, and their staff at the University of California, Davis, on March 24, 1981. The experimental outlines prepared for spring and summer experiments to be done at Tiburon were evaluated and discussed. Crosby and Bowes also described their experiments on effects of synthetic hydrocarbons on striped bass and the results of scans for EPA priority pollutants.

Experiment Planned to Study Effects of Zinc and Benzene on Striped Bass

Nina Hirsch, Research Biologist at San Francisco State University, has completed the designs for spring and summer experiments, with the assistance and guidance of Dr. Jeannette A. Whipple, Chief of the Physiologial Ecology Investigation of the Tiburon Laboratory; Marvin Jung, State Water Resources Control Board (SWRCB), Co-Director of COSBS; and other Physiology staff members. In general, the planned experiments will explore the synergistic effects of low levels of zinc and benzene on striped bass of several life history stages, including gametes, eggs, larvae, juveniles, and pre-spawning adults.

In cooperation with Dr. Michael Moser, Parasitologist at the University of California, Santa Cruz, members of the Physiological Ecology Investigation have infected juvenile striped bass with parasitic larval cestodes or roundworms. The bass will then be exposed to varying combinations of zinc

and/or benzene, and the uptake and effects will be measured. The reverse experiment will also take place, first exposing fish to low levels of benzene and/or zinc (corresponding to chronic levels in the San Francisco Bay-Delta) and subsequently exposing them to parasitic worm larvae. Effects of pollutants on the susceptibility of fish to infection, subsequent lesion development, and immune responses will be determined. The occurrence of cestode larvae and lesions resulting from infection has been documented by Moser in field-captured striped bass.

Additional experiments will be done, testing the effects of benzene on pre-spawning striped bass gametogenesis and measures of reproductive fitness as well as the effects of benzene and/or zinc on eggs and larvae. The toxicity of alkyl cyclohexane petrochemicals to juvenile striped bass will also be determined. Pollutants chosen for exposure experiments have been found in tissues of striped bass from the San Francisco Bay-Delta. Other experiments testing effects of synthetic hydrocarbons, e.g., toxaphene, are planned for FY-1982.

Physiology Laboratory Prepared for Pollutant Studies

Preparation of the Physiology Laboratory for the new series of experiments, which was directed by Maxwell Eldridge, with consultation and assistance from the Physiological Ecology Investigation and San Francisco State University staffs, is essentially complete and all necessary equipment has been ordered. The new design will enable investigators to expose fish to varying combinations of pollutants with a variety of options, including either fresh or saltwater, depending upon life history or maturation stage. This will be important in examining effects in anadromous fishes such as striped bass, particularly in the pre-spawning and spawning stages.

Sample Analyses and Data Analyses of Field Captured Striped Bass (1978-1980) Continue

Analyses are continuing on samples taken from adult and subadult striped bass from 1978 to 1980. The analysis of monocyclic and cyclohexane petrochemicals in gonad and liver tissues has been completed by Research Technicians Judy Sakanari and Carol Reilly of the State Water Resources Control Board (SWRCB), under the direction of Supervisory Fishery Biologist Pete Benville, Physiological Ecology Investigation.

Studies are being made of ovaries and eggs of pre-spawning striped bass. Slides were prepared by Biological Technician Michael Bowers and are being examined by Supervisory Fishery Biologist Dr. Jeannette Whipple for evidence of abnormal gametogenesis, resorption, and necrosis. Photographs have been taken of different maturation stages and abnormal conditions.

Studies on blood cells, including differential white blood cell counts, are now in progress and should be completed soon. Slides have been prepared by Brian Jarvis, Biological Technician, and are being evaluated by Dr. Whipple. Photographs are also being taken of the blood cells.

Preliminary results of the above analyses indicate that fish sampled in 1978 showed more evidence of abnormal conditions than those from later years (1979-1980). These effects include extensive thrombocytopenia, lymphocytopenia, proliferation of immature white cells and abnormal red blood cells. Also observed were higher numbers of abnormal or resorbing eggs in ovaries in 1978 fish. Correlated with this are the concentrations of petrochemicals in livers and ovaries: fish collected in 1978 have significantly more benzene and other monocyclic aromatics than fish sampled later. It is interesting to note that 1978 was a low-water year which followed 2 years of drought in the San Francisco Bay-Delta, while 1979 and 1980 were normal flow-years.

Whipple and her assistant, Rahel Fischer, are working with Nina Hirsch and staff (San Francisco State University), and Nancy Wiley, Computer Specialist, ADP (Tiburon Laboratory), on completing entry, checking, and keypunching of data, as well as preliminary programs and calculations on all data from fish collected from 1978 to 1980.

Whipple has also prepared a listing of all measured variables to be included in the analyses, as well as a schedule for completion. There are 302 variables measured for each of most of the 467 fish. Data analyses are proceeding and a preliminary report on the results of the field sampling will be prepared for presentations to the California Department of Fish and Game, State Water Resources Control Board, and the Office of Marine Pollution Assessment (OMPA) by mid-April. This report will be followed by publication of this information.

* * * * * * * * * *

Dr. Jeannette Whipple gave a presentation to four board members of the State Water Resources Control Board in Sacramento, California, on March 24, 1981. Two presentations were given. Those in attendance at the first session included Carla Bard, Chairman of the SWRCB. A summary of progress and results to date on the striped bass study was presented. Additional support from the SWRCB has been requested by Marvin Jung, Co-Director of COSBS.

Public Meeting on Status of Striped Bass Fishery Planned

Plans are being formulated by the SWRCB for a public meeting on the status of the striped bass fishery on April 27, 1981, in San Francisco. Notification of the meeting will be given. Dr. Whipple will present findings from the NMFS research. Harold Chadwick (Califoria Department of Fish and Game, Stockton) will also present findings from their recent analysis. It is expected that some action will follow to ensure the continued survival of the population of this important recreational fishery.

Assistance Provided to Chevron Oil Company for Testing Effects of Waste and Cooling Waters from Chevron's Effluents

Mike Fawcett from CH_2M Hill Company, under contract to the Chevron Oil Company, visited the Physiology Laboratory to consult with Maxwell Eldridge and Brian Jarvis in order to discuss experimental designs for testing effects of waste and cooling waters from Chevron's effluents. The animals that will probably be used in the studies include striped bass and flatfish.

LIBRARY

First Pacific Coast NOAA Library to Become a Member of the On-Line Library Center

The Tiburon Laboratory joined the On-Line Computer Library Center (OCLC), and became the first NOAA Library on the Pacific Coast to become a member. OCLC operates an on-line library system for academic, public, and special libraries. OCLC is a computer network system that gives users access to an on-line file of information of approximately 5.8 million books and other library materials.

Librarian Maureen Woods received training on OCLC. David Brunell, from the Federal Library Committee, Washington, D.C., provided the training on March 3, 1981, at the Tiburon Laboratory.

SOUTHWEST REGIONAL DATA MANAGEMENT AND ADP OPERATIONS

Fishery Information Network California System Study Completed

The Fishery Information Network California System Study, which presented alternatives and recommendations on the California Department of Fish and Game (CF&G) Marine Fisheries Statistical Data Collection System in order to improve data timeliness, completeness, and correctness, has been completed. The finished report on the study presents background data, reviews the current statistical system, analyzes current and future needs, and recommends the action needed to improve the fishery data during 1981-1983. Fred Kellenberger, Data Systems Manager at the Southwest Fisheries Center, and Dick Heiman (CF&G) monitored the contract for the study, performed by Science Applications, Inc. The California Department of Fish and Game, the Southwest Fisheries Center, and the Southwest Region are presently in the process of reviewing the study and will determine which recommendations will be adopted, make detailed project plans, specify goals, objectives, work tasks and project assignments, and specify the implementation schedule.

Transfer and Validation of Data From INFONET to Burroughs/VAX Computer Systems Continues

Dorothy Roll, Systems Analyst, reports excellent progress on the transfers of data and program files from the INFONET system to magnetic tapes for implementation on the University of California, San Diego's, Burroughs/VAX systems. Files from 9 of the 13 porpoise accounts have been taped and will undergo systematic validation on the VAX system. All tuna and billfish files have been transferred and approximately 50% of these files have been validated on the Burroughs system. Of the four Coastal Division accounts, 75% of the files have been transferred and validated on the Burroughs/VAX systems. Files from 6 of 11 accounts handled by ADP Operations have been transferred for validation on the Burroughs/VAX systems.

INFONET Contract Extended Through Septemper 1981

The ADP Procurement Branch of the Department of Commerce (DoC) and General Services Administration (GSA) approved the extension of the existing INFONET contract from May 1, 1981, through September 30, 1981. DoC's stipulations are 1) all data and program file transfers must be completed by April 30, 1981, and 2) the extension period is for the production of essential financial reports and critical tuna-porpoise reports. For these reports, the updating of the associated data base files is permitted.

Procedures for Financial Reporting System Outlined

Dorothy Roll and Oden Burris, Computer Programmer, met with Ben Remington, Executive Officer, to clarify procedures for restoring the Financial Reporting System (FRS). Production runs of the financial reports are scheduled for the end of March. Because of the dollar limitation in the approved INFONET contract extension, cost-saving operating procedures for FRS were developed and implemented. In brief, the FRS files will be available on-line for only a specified period of the month; initial data cannot be entered on an inter-active keyboard terminal; data entries submitted on FRS code sheets will be punched/verified and entered on the system by ADP Operations; card data entries to correct the data may be submitted by the users on an inter-active terminal during the 5 working days prior to month-end; month-end reports may be requested from an inter-active terminal during these 5 days; requests for special interim reports must be submitted to ADP Operations 3 working days prior to the date the reports are required.

ADP Long-Range Plan for FY 1982-83 Readied

Dorothy Roll, Systems Analyst, and Fred Kellenberger, Data Systems Manager, report that they are working on the Southwest Fisheries Center/Southwest Region FY 1982-83 ADP Long Range Plan. The Plan will define the functional information requirements of the SWFC/SWR, present alternatives, and recommend a proposed solution to satisfy the information requirements. The Plan will cover the FY 81 through FY 85 time period and is needed by the DoC ADP Planning and Policy Group. Kellenberger attended the National Data Management Committee (NDMC) meeting in March, the primary objective of which was to discuss the ADP Long Range Plan. Each Fisheries Center will develop a long range plan which will then be integrated by NMFS Headquarters.

Technical Users Meetings Held

ADP Operations hosted four technical users meetings during March. Two sessions were conducted by the UCSD computer consultants. In the first, Jerry Fitzsimmons and Rick Accurso of UCSD's Computer Center addressed the secretarial and computer staff on the capacilities of CATT, a powerful word processing system supported by the Computer Center. In the second session, Jerry Fitzsimmons discussed the features of a multiplexer, which is a band of eight lines connecting users directly to the data switch at UCSD for queuing into the Burroughs, VAX and CATT. Installation of a multiplexer at the La Jolla Laboratory would ease the inter-active access problems to UCSD's computers.

During the other sessions, Computer Programmer Oden Burris outlined the Burroughs tape procedures and Computer Specialist Robert Butler discussed tape copy procedures from INFONET to VAX and the features of ISAM, the indexed sequential file system on VAX. Butler also described TAPEALL, a prompting command file program he developed to assist users in writing VAX system copy tapes. The documentation of these procedures and examples of job streams were distributed to the attendees. The technical users have responded with praise

for the conduct of these meetings and cited the meetings as a valuable avenue for the resolution of hardware/software problems.

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The Southwest Fisheries Center's request to sole source computer services from the University of California, San Diego (UCSD) is under review by Automatic Data Processing (ADP) Policy Division in NOAA and the Department of Commerce. The period of service is from April 1, 1981 through September 30, 1981. Because approval will not be granted by April 1, the current UCSD contract, which expires March 31, has been extended through June 30, 1981.

MISCELLANEOUS

HONORS AND AWARD

La Jolla Laboratory

The following La Jolla Laboratory employees received length of service awards: Dorothy Roll, Systems Analyst, 30 years; Lillian Vlymen, Technical Writer/Editor, 30 years; Dan Gittings, Librarian, 25 years; and Ken Bliss, Oceanographer, 15 years.

Barbara Watkins Receives NOAA Fellow Hard Worker Award

Barbara A. (Bobbi) Watkins has been awarded the Fellow Hard Workers award for 1980. This award is presented on behalf of the Fellow Hard Workers Committee of NOAA, in recognition of Watkins' outstanding contribution in the area of supply and purchasing for the La Jolla Laboratory. This award is one of 12 given to NOAA employees "who, in rain or shine, hot or cold, go the extra mile."

PUBLIC AFFAIRS

Honolulu Laboratory

On March 3, Laboratory Director Richard Shomura spoke on Hawaiian fisheries to a group at the Aloha Tower Maritime Center.

La Jolla Laboratory

On March 20, a class from Saddleback College, Mission Viejo, California, visited the La Jolla Laboratory. The students in the Marine Science Research class, along with their instructor, Ms. Robin Valencic, met with Dr. John Henderson to talk about collecting data for the Coastal Marine Mammal Project from a vessel owned by Saddleback College. The students were also given a tour of the life history and age determination laboratories, and Fishery Biologist Barbara MacCall spoke with them about the larval fish collection and related research.

Tiburon Laboratory

On March 18, Fishery Biologist Maxwell Eldridge presented a talk on the "Research of the Physiological Ecology Investigation" to a Marine Biology Class at Dominican College in San Rafael, California.

On March 27, Dr. Edmund S. Hobson presented a talk on "Shorefish Communities" to the Biology Department at San Francisco State University.

PRESS RELEASE

Honolulu Laboratory

March 4 - "Research vessel completed cruise to Northwestern Hawaiian Islands."

SEMINARS

La Jolla Laboratory

March 9 - Dr. Charlie Miller, Oregon State University, spoke on the "Ecology of herbivorous zooplankton in the subarctic Pacific."

23 - John Trent, Scripps Institution of Oceanography, presented a talk on "Plankton in vivo, in situ."

Tiburon Laboratory

March 17 - Dr. Daniel Wickham, Bodega Bay Marine Laboratory, presented a joint San Francisco State University/Tiburon Laboratory seminar at the Tiburon Laboratory entitled, "The crab egg predator Carcinonemertes errans: Cycling and collapse of the dungeness crab population."

TRAINING

Tiburon Laboratory

March 17-20 - Jeanne Hurst, Administrative Clerk - "Simplified Procurement Methods and Techniques," Office of Personnel Management, San Francisco.

VISITORS

Honolulu Laboratory

March 2 - Charlotte Mauldin, Pago Pago, American Samoa.

- Janet Swift, Hawaii Department of Economic Development.

- Glenn Kiel, NMFS Fishery Inspection Office, Seattle, WA.

- Richard Cano and Gilbert Higa, Hawaii Department of Agriculture.

11 - William Bodde, Jr., U.S. Ambassador to Fiji.

13 - Joaquin Rafael Branco, Ministry of Education, and Arlindo Tereira Braganca Gomes, Ministry of Agriculture, Sao Tome/Principe, accompanied by Teresa J. Wilkin, Deputy Director, International Communications Agency Reception Center, Honolulu, and Lina Meyer, Interpreter, Department of State.

21 - Andrew M. Trutanich, Star-Kist Foods, Inc., CA., and George Souza, San Diego, CA.

24 - Dr. Richard Radtke, Pacific Game Foundation.

La Jolla Laboratory

March 2 - Peter Miyake, Fishery Agency, Japanese Government, Tokyo, Japan.

3 - John Zoeger, Los Angeles County Museum of Natural History, Los Angeles, CA.

4 - Makoto Terazaki, Ocean Research Institute, University of Tokyo, Japan.

10 - Terry Leitzell, Assistant Administrator for Fisheries, and Howard Fraley, NASO, came to the La Jolla Laboratory to meet with Dr. Izadore Barrett, Center Director, and talk with Center personnel.

- Richard Roe, Office of Marine Mammals and Endangered Species, Washington, D.C., met with Dr. Barrett.

13 - Shojiro Shimura and Yuichiro Harada, Federation of Japan Tuna Fisheries Cooperative Association, Tokyo, Japan.

16 - Susumu Hakida, Van Camp Sea Food Company, Tokyo, Japan.

- Soon Jez Cho, Van Camp Sea Food Company, American Samoa.

16-17 - Dr. Sam Bledsoe, University of Washington, came to meet with Dr. Michael Laurs and Dr. Norman Bartoo regarding the albacore modeling contract.

17 - Robert Lavenberg, Los Angeles County Museum, visited the larval lab to pick up loan specimens and deliver reprints.

19 - Michael Corum, Office of Personnel Management, visited the Center to present a seminar to supervisors.

23 - Richard Lord, who is from England and currently at Humboldt State University, CA visited with Dave Leighton and Roger Leong regarding aquaculture.

24 - Admiral Charles K. Townsend, Director of the Pacific Marine Center, visited Dr. Barrett and John Carr.

- Candice Turner, NASO Personnel, Seattle, WA met with Dr. Barrett.

30 - Dr. Richard Gordon, University of Manitoba, Canada, visited with Dr. John Hunter and toured the larval lab. They discussed the origin of pigment cells and use of fish larvae to study this phenomenon.

Tiburon Laboratory

March 9 - Grayson Hinckley, Applied Aquatic Resources Institute, Presidio of San Francisco, CA.

20 - Steven Halapua and Halmes Matao Saene, Institute of Marine Resources, Fiji, Japan.

- Dick Stine, Information Design, Mountain View, CA.

23 - Howard A. Takata, University of Hawaii, Sea Grant Marine Advisory Program, Hilo, HI.

24 - Willis Bussard, Applied Aquatic Resources Institute, Presidio of San Francisco, CA.

MEETINGS AND TRAVEL

Honolulu Laboratory

March 14-18 - Ray F. Sumida traveled to Ponape, Eastern Caroline Islands, to train Micronesian Maritime Authority (MMA) personnel on fish identification, fishing operations, and data collection. The trip was underwritten by MMA.

19-20 - Walter Matsumoto attended a squid workshop at the Northwest and Alaska Fisheries Center, Seattle, WA.

25 - Richard Shomura, Laboratory Director, attended a meeting of the Scientific and Statistical Committee of the Western Pacific Regional Fishery Management Council (WPRFMC).

30 - Richard Shomura, Dr. Robert Skillman, and Dr. Michael Adams attended a meeting at the State Capitol to discuss the national recreational fishery survey.

31 - Richard Shomura attended the 29th WPRFMC meeting at the State Capitol.

La Jolla Laboratory

March 2- 6 - Dr. Izadore Barrett, Center Director, traveled to Washington, D.C., to attend a Board of Directors meeting and a Research Council meeting.

3- 8 - Dr. Doug DeMaster traveled to Point Reyes, CA to coordinate data analysis of elephant seal tagging with the Pt. Reyes personnel and appraise the facility as a research option.

4 - Dave Mackett traveled to Terminal Island, CA to attend a State/Federal planning meeting.

5- 6 - Dr. Daniel Huppert traveled to Davis, CA to confer with the UC Davis Sea Grant investigators regarding economic studies of California.

7- 8 - Dr. William Perrin presented a lecture at the University of California, Davis.

9-12 - Fred Kellenberger traveled to Washington, D.C. to attend a a National Data Management Committee meeting.

13 - Dr. Izadore Barrett, John Carr, David Mackett, Dr. Reuben Lasker, and Dr. Gary Sakagawa traveled to Terminal Island, CA to attend a SWR/SWFC meeting.

16-17 - Dr. Izadore Barrett, Center Director, traveled to Renton, WA to attend the Pacific Council's SSC meeting on Pacific Salmon Management.

16-18 - Daniel Huppert traveled to Renton, WA to attend the Pacific Management Council/SSC meeting on Pacific Salmon Management.

16-20 - Dave Mackett traveled to Honolulu, HI to attend a ciguatoxin research planning session.

20-22 - Jacqueline Jennings traveled to Santa Barbara, CA to participate in a NASA-Marine Mammal Commission meeting on Technical Applications to Biology.

24 - A preproposal conference for the operation and maintenance of tide gauges was held at the La Jolla Laboratory for NOAA personnel and contractors from the Los Angeles and San Diego areas.

24-25 - Dave Mackett traveled to Long Beach, CA to attend a State/Federal meeting on sharks and billfishes.

27 - Fred Kellenberger attended a FIN planning meeting in Long Beach, CA.

March 29-April 1 - Dave Mackett traveled to Alexandria, VA to attend an East Coast Planners meeting.

March 30-April 1 - An International Union for Conservation of Nature/Marine Mammal Interactions meeting was held at the La Jolla Laboratory.

PERSONNEL ACTIONS

Honolulu Laboratory

March 6 - Anjanette S. Perry, Computer Clerk, Completion of 1040-hour appointment.

12 - Jiro Morisako, Economist, Completion of special-need appointment.

16 - Carol K. Gravensen, began service as a student volunteer.

La Jolla Laboratory

March 8 - Hillary Herring-Dyal, Fishery Biologist, Return to Duty

22 - Mary DeWitt, Clerk-Typist,
Promotion

23 - Richard Kiy, Biological Science Student Trainee,
Return to Duty

Tiburon Laboratory

March 20 - Pearl Bradley, Clerk,
Redesignated (FES Format)

HONOLULU LABORATORY STAFF SEND GREETINGS FROM HAWAII

Left to Right

FIRST ROW (sitting or kneeling on grass): Gary L. Steiger, Howard O. Yoshida, Walter M. Matsumoto, Randolph K. C. Chang, Andrew E. Dizon, Thomas K. Kazama, Tamio Otsu, Tamotsu Nakata, Heeny S. H. Yuen, Darryl T. Tagami.

SECOND ROW (sitting on bench): Carole A. Yukihiro, Hazel S. Nishimura, Irene H. Toyomura, Elizabeth F. Y. Young, Marian Y. Y. Yong, Virginia L. Ishida, Alice-May Drury, Dorothy D. Powell, Martina K. K. Queenth, Lucille T. Tsukano, Jeri M. Davis, Jeffrey D. Sampaga.

LAST ROWS: William G. Gilmartin, Eric P. Knudtson, Sharon D. Hendricks, George H. Balazs, Richard S Shomura (Director), Bert S. Kikkawa, Stephen Ralston, Robert L. Humphreys, Jr., Mark A. Scheele, Victor A. Honda, Steven H. Kramer, Natheniel T. Shippen, William B. Barnett, Michael F. Adams, Gary L. Kamer, James C. Cooper, Reginald M. Gooding, Robert A. Skillman, Jeffrey J. Polovina, Jose Enitan, Gordon W. Tribble, Alan R. Everson, James H. Uchiyama, George W. T. Liao, Bernard M. Ito, Tamotsu Nakamura, Fletcher V. Riggs, Richard N. Uchida, Paul M. Shiota, Joseph T. Arakawa.

Permanent staff members missing from picture: Melvin J. Dutro, Sr., Mary Lynne Godfrey, Thomas S. Hida, Sally H. Kuba, Ray F. Sumida, Shoji Teramoto, and Jerry A. Wetherall.

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